CHAPTER 1

INTRODUCTION

1.1 Background of the Study

In most developing countries, one of the contributor of the industrial sector growth is chemical industry. It gives important contributions to the economic development. In Asian countries including Malaysia, the increasing demand for chemical products has resulted in the rise of manufacturing sector. The overall chemical production in the Asia-Pacific region is forecast to increase by 5.2% by 2015 and afterwards (*World of Chemicals, 2015*). One of the cluster which is in developing stage is chemical industry including major chemical sector located in Teluk Kalong, Kemaman (*MIDA, 2017*).

As the growth of the chemical sector rise, the other aspect that should be greatly concerned is chemical safety-related. In industry, there are high potential for major accident events (MAE), where the problem become more serious with the increasing production, storage and use of hazardous substances. Chemical accident such as chemical release can cause catastrophic consequences not only to the employees but also to residents and the environment as the dispersion of the toxic gas will become worst as the wind speed increase (*Faisal and Abbasi, 1999*).

At any processing plant, process safety becomes the most crucial factor in ensuring the safety of the plant. It focuses on preventing fires, explosions and accidental chemical releases in chemical process facilities or other facilities dealing with hazardous materials such as refineries, and oil and gas (onshore and offshore) production installations (Daniel and Joseph, 2002). Unexpected releases of toxic, reactive, or flammable liquids and gases in processes involving hazardous chemicals have been reported for many years and continue to occur in various industries.

In this regard, chemical plant in general has a high risk for developing accidents. As such, in reaction of such disaster, the workers and residents that is living nearby need to take shelter in a safer place within short period of time. Hence, the evacuation routes that safe from the incident need to be figured out (Vania et al.,2012). Evacuation route is a major part of Emergency Response and Planning which itself a part of Process Safety Management. Hence, a proper action should be taken to avoid the catastrophic incident from happening.

1.2 Motivation

Recently, major accident in chemical plant had been frequently reported in Malaysia. On September 16, 2016, there was a chlorine explosion in a chemical plant. The explosion sent a stinging odor to the air and had caused the residents suffered itchy throats and severe coughs accompanied by a burning sensation in their throats. Not only that, some workers of the plant had been diagnosed suffers from pneumonia. (The Star Online, 2016). On the next cases, on August 16 2016, two workers were killed in ammonia leak in a chemical plant located in Sipitang, Sarawak (Malaymail Online, 2016).

According to the Chris Kilbourne, workers need to be trained well to stay safe from the gas leak. He also added that the workers need to be trained to escape from the gas leakage area. However, the area of gas leakage cannot be discovered in a short time, unlike fire explosion, gas dispersion cannot be detected earlier due to its color. Hence, there is a need for a simulation of gas leakage before the incident occur. This will help the person in charge during the day of the incident to give a safe command to the other workers to escape to a safer place and the affected area will be avoided.

1.3 Problem Statement

Emergency Response and Preparedness (ERP) is to provide safe and proper operations at the workplace. It includes emergency response plan which is the actions taken in the initial minutes during an accident occur. This plan is very crucial as it can save lives of workers and also public by preparing the plan for the evacuation during the day of the accident (Ralph, 1990). In the study area, it is found out that there are no evacuation routes has been planned and it will only be decided by the person in charge

at the plant. Accident is an unexpected event which cannot be predicted when and where it will occur. Hence, it is a crucial need for an evacuation planning especially in chemical industry which is dealing with hazardous substances. Thus, potential threat needs to be identified first (Moura et al., 2016).

1.4 Objectives

The following are the objectives of this research:

1) To identify the potential hazards from the sulfuric acid dispersion at the chemical plant.
2) To study the downwind concentration of the sulfuric acid for the impact on the toxic release from the storage tank.
3) To develop the evacuation routes for the sulfuric acid release.

1.5 Scopes of Study

The following are the scopes of this research:

1) Process Safety Concept is the main principle and it is carried out in a chemical facility.
2) Process hazard analysis specifically using the Areal Location of Hazardous Atmospheres (ALOHA) software as our consequence modelling approach; thus to predict any incident which might occur.
3) Elements such as the route planned, incident command post and assembly area are taken into consideration for a safe emergency evacuation.